



CSA PCP-09

# Certified Exposure Device Operator Personnel Certification Guide

MARCH 2015

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## 1.1 PURPOSE OF THIS GUIDE

This certification guide provides guidance for qualified persons on the recommended procedures to achieve and renew an Exposure Device Operator (EDO) personnel certification.

This personnel certification guide is provided for informational purposes only. The most current version of this document, as published on the CSA Group Web site, shall prevail in case any discrepancy occurs between this version and the official released version of this guide.

This document represents the recommended systematic process for the certification of persons as exposure device operators in Canada and verification of the competence of CEDOs seeking recertification. Compliance with these certification and recertification processes provides evidence that the individual meets the minimum competence for knowledge skills and abilities to be designated as a Certified EDO (CEDO). The process is consistent with industry-accepted professional practice, regulatory expectations and legal recommendations.

This document has been developed to assist the following groups:

- EDO candidates
- CEDO's
- Educational institutions and other organizations that design or offer vocational training programs for EDO candidates
- Educational institutions, gamma radiography licensees and other organizations that design or offer on-the-job programs for EDO candidates
- Any organization or government department that administers, on behalf of the CNSC, the written examination or practical examination to EDO certification candidates or CEDO renewal of certification candidates.

This document has been developed through the participation of professionals from CSA Group, radiography industry, and government departments and regulators through membership in the primary scheme committee and various sub-committees, and through surveys of the stakeholder population determined by the scheme committee.

## 1.2 ABOUT CSA GROUP

CSA Group (an operating name of the Canadian Standards Association (CSA) and its wholly owned subsidiary CSA America, Inc.) is a not-for-profit, membership-based, solutions-oriented organization, serving business, industry, government and consumers in North America and the global marketplace. Our corporate vision is a better, safer, more sustainable world where standards work for people and business. CSA Group achieves this goal by focusing on the development and delivery of standards and codes, application products, training and personnel certification programs - all aimed at enhancing public safety, improving quality of life, preserving the environment and facilitating trade.

CSA Group also provides testing and certification services for electrical, mechanical, plumbing, gas and a variety of other products; and provides consumer product evaluation, inspection and advisory services for retailers and manufacturers. For more information on CSA Group, please visit their web site [www.csagroup.org](http://www.csagroup.org).

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## 1.3 CERTIFICATION GUIDE CONTACT INFORMATION

CSA Group  
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Fax: (877) 539-7613  
Email: [training@csagroup.org](mailto:training@csagroup.org)  
[www.csagroup.org](http://www.csagroup.org)

## 1.4 ABOUT THE CNSC

The Canadian Nuclear Safety Commission (CNSC) regulates **broadly with respect to nuclear matters including in relation to** the production, possession and use of nuclear substances, prescribed equipment and prescribed information in order to prevent unreasonable risk to the environment, the health and safety of persons and the security of Canadians; and to implement Canada's international commitments on the peaceful use of nuclear energy. The CNSC regulates nuclear substances used in medical, research and industrial applications.

The *Nuclear Substances and Radiation Devices Regulations* created under the *Nuclear Safety and Control Act* (NSCA) state that industrial gamma radiography licensees can only permit CNSC-certified personnel and supervised trainees to use exposure devices containing nuclear substances. To perform industrial radiography or operate an exposure device in Canada, the operator must be a certified exposure device operator.

## 1.5 LEGAL AUTHORITY

The CNSC's regulatory framework consists of laws and licences issued by the CNSC, and various instruments and documents used by the CNSC to regulate nuclear matters in Canada, passed by Parliament that govern the regulation of Canada's nuclear industry, and regulations, licences and documents that the CNSC uses to regulate the nuclear industry. The CNSC's legal authority comes from the NSCA which, in its preamble, states that it is essential for national and international interests to regulate the development, production and use of nuclear energy and the production, possession and use of nuclear substances, prescribed equipment and prescribed information. It also requires that consistent national and international standards be applied to the development, production and use of nuclear energy.

## 1.6 REGULATION OF EXPOSURE DEVICES

One of the CNSC's objects, as found in section 9 of the NSCA, is to regulate the use of certain types of equipment including exposure devices. Through its regulation making power found in section 44 of the NSCA, the CNSC has developed the *Nuclear Substance and Radiation Device Regulations* which, in turn, put in place a variety of rules in relation to the use of exposure devices and the obligations of CEDOs.

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## 1.7 CERTIFICATION OF EXPOSURE DEVICE OPERATORS

Only a certified exposure device operator (CEDO) can legally operate an exposure device and only the CNSC can certify a person as a CEDO. As stated in section 24 of the *Nuclear Substances and Radiation Devices Regulations*, “No person other than a certified exposure device operator, or a trainee who is acting under the direct supervision and continuous observation of a certified exposure device operator, shall operate an exposure device.”

## 1.8 LICENSEE OBLIGATIONS CONCERNING CEDOS

As outlined in Section 12 of the *General Nuclear Safety and Control Regulations* (GNSCR), qualified workers (CEDO's) must be trained in the use of each device model prior to operation and the licensees must, among other obligations, ensure the work is carried out in a safe and secure manner.

## 1.9 CONTACT THE CNSC

**Mail:** Canadian Nuclear Safety Commission  
280 Slater Street  
P.O. Box 1046, Station B  
Ottawa, Ontario  
Canada K1P 5S9  
**Phone:** (800) 668-5284 (in Canada only) or (613) 995-5894  
**Fax:** (613) 995-5086  
**Email:** [info@cnsccsn.gc.ca](mailto:info@cnsccsn.gc.ca)  
[www.nuclearsafety.gc.ca](http://www.nuclearsafety.gc.ca)

## 1.10 ACKNOWLEDGEMENTS

The development of this personnel certification guide was made possible by the efforts of the industrial radiography industry and the CNSC.

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## 1.11 PERSONNEL CERTIFICATION SCHEME COMMITTEE

This personnel certification examination and guide were developed as part of a contractual agreement between the CNSC and CSA and under the guidance of the CSA Exposure Device Operator Certification Scheme Committee.

Scheme Committee Members:

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T.	Beniston	Stuart Hunt & Associates Ltd.
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R.	DeBruyn	Aztec Inspection Inc.
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P.	Larkin	Canadian Nuclear Safety Commission
T.	Levey	Acuren Group, Inc.
D.	Marshall	Canadian Institute for NDE
T.	Melnyk	Babcock and Wilcox Canada
H.	Rabski	Canadian Nuclear Safety Commission
R.	Rodericks	Canadian Nuclear Safety Commission
F.	Rodier	Labcan Ltée
B.	Scott	Bruce Power, LP
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J.	Pyne	Canadian Nuclear Safety Commission
D.	Sullivan	Canadian Nuclear Safety Commission



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## 1.12 ABOUT THIS CERTIFICATION

The CNSC Exposure Device Operator Personnel Certification Program is designed to help ensure the continued competency of the persons, and the safety and security of persons and devices when working with certified exposure devices. Certified individuals will have the demonstrated ability to safely and securely handle, transport, store and operate these exposure devices and any accessories to the devices, properly utilize radiation detection and monitoring equipment, and have an understanding of and an obligation to comply with all relevant regulatory requirements.

This certification has been developed for individuals and organizations operating and/or providing training to safely operate exposure devices, and outlines the requirements to successfully obtain this certification. Earning the CEDO designation will indicate that the candidate possesses the knowledge, skills and abilities necessary to safely operate exposure devices. CEDOs will be re-assessed every five years to ensure they remain up-to-date on technical developments and industry changes.

The CNSC maintains a registry of exposure device operators certified to operate exposure devices in Canada. Please contact the CNSC for a listing of CEDOs in Canada.

# Exposure Device Operator Personnel Certification

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## 2.1 PROGRAM RATIONALE

The Exposure Device Operator certification has been developed for the following purposes:

- To verify the knowledge, skills and abilities of personnel operating certified exposure devices used in industrial radiography;
- To protect the health, safety and security of the public, workers and the environment;
- To meet the requirements of the *Nuclear Safety and Control Act* and regulations made pursuant to the Act;
- To encourage consistency and best practice throughout the radiography industry and to promote strong radiation safety culture and security requirements.

## 2.2 QUALIFICATIONS OF A CERTIFIED EXPOSURE DEVICE OPERATOR

CEDO personnel must be able to safely and securely handle, prepare for transport, store and operate industrial gamma radiography exposure devices and any accessories to these devices, properly utilize radiation detection and monitoring equipment, and have an understanding of, and an obligation to comply with all relevant regulatory requirements.

The Exposure Device Operator Certification Program tests each candidate through written and practical examination to ensure the individual possesses the knowledge, skills and abilities of the CEDO as determined by CSA's expert committee:

- A CEDO must have basic mathematics skills (knowledge of basic algebra) and be able to use arithmetic operations such as division, multiplication and ratios. The CEDO may normally have direct access to data tables for mathematical determinations; however, all would require an understanding of the table and ability to read the data correctly. This requirement is based on the professional opinion of the Scheme Committee that developed this document and is deemed to be a fair and equitable requirement.
- A CEDO should be physically able to carry and manipulate equipment. This applies to the exposure device, accessories, radiation detection, and emergency equipment.
- A CEDO certification is necessary to provide supervision and guidance to trainees. Under the CNSC's *Nuclear Substance and Radiation Device Regulations*, a CEDO may be appointed to supervise and be responsible for a trainee.
- A CEDO must exercise sufficient judgment and responsibility to effectively perform safety-sensitive operations. The CEDO is responsible to ensure the safety of all individuals who may be affected by the CEDO's activities, as well as the security and control of the exposure device and nuclear substance when it is in their possession. It is essential to take all reasonable precautions to prevent the loss or theft of, or damage to the device.

# Exposure Device Operator Personnel Certification

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When working as a CEDO, there are equipment, tools and information with which a CEDO must be familiar. These include (but are not limited to) the following:

- Radiation detection and monitoring instrumentation essential to radiography operations and required by CNSC regulations (including radiation survey meters);
- Personal dosimeters, issued by a CNSC-licensed dosimetry service provider;
- Direct reading personal dosimeters that are calibrated, used for recording radiation doses and provide an immediate indication of the doses received by the worker;
- Calibrated personal dosimeters that emit an audible warning signal;
- A radiation survey meter that is calibrated and capable of detecting and measuring radiation dose rates associated with exposure devices;
- The licensee-specific make and model of the certified exposure device and its accessories;
- The licensee-specific radiation safety manual including emergency procedures, operational procedures, record keeping requirements, forms and contact information;
- A current copy of the CNSC radiography licence for the exposure device, the *Nuclear Safety and Control Act* and any regulations applicable or pertaining to industrial radiography operations;
- Radiation warning barriers and sign, go/no-go gauges, positioning fixtures and collimators; and
- Emergency equipment including, but not limited to, shielding material, tongs and a cutting device.

## 2.3 EXCLUSIONS TO THE EXPOSURE DEVICE OPERATOR CERTIFICATION

The certification program outlined in this document DOES NOT qualify the CEDO to do the following:

- Transport Class 7 dangerous goods;
- Work as a Certified Non-Destructive Testing Personnel (RT Level 1, Level 2 or Level 3) Canadian General Standards Board 48.9712 as administered by Natural Resources Canada;
- Respond to industrial radiography emergency situations (e.g. source retrieval); or
- Maintain and repair industrial radiography exposure devices.

The above will require additional certification or training.

## 2.4 CERTIFICATION PREREQUISITES

Section 25 of the Nuclear Substances and Radiation Devices Regulations identify minimum requirements for applying for certification:

*25. The Commission or a designated officer authorized under paragraph 37(2)(b) of the Act may certify a person as an exposure device operator after receiving an application that includes the following information:*

# Exposure Device Operator Personnel Certification

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(a) *the person's name and business address;*

(b) *the person's training and experience; and*

(c) *evidence of the successful completion by the person of an examination recognized by the Commission.*

This Guide has been developed to assist applicants, or persons thinking about applying, with knowing what would generally be considered a satisfactory application. However, it is important to recognizing that the CNSC is not obligated to certify everyone who meets or even exceeds all of the recommendations set forth in this Guide. It is also important to recognize that every application is considered individually and decisions can be based on a variety of factors.

With the above in mind, it is generally accepted that the following would constitute a strong basis for consideration as a CEDO:

- Successful completion of a pre-certification mathematics examination
  - Natural Resources Canada (NRCan) mathematics examination for non-destructive testing with a 75% grade minimum; or
  - Equivalent mathematics examination as accepted by the training provider;
- Be at least 18 years of age;
- Documented successful completion of an exposure device operator vocational training program as described in Section 2.5 of this document ;
- Documented completion of 320 hours of on-the-job training, as described in Section 2.5 of this document;
- Documented completion of the Exposure Device Operator – Practical Examination (Appendix A); and
- Successful completion of the EDO written exam as recognized by the CNSC.

The vocational and practical training components should be completed within two years of the start of the vocational training. It is further recommended that practical and written examinations only be taken by EDO trainees after they have successfully completed the training program referenced in this Guide. Any EDO who has satisfactorily completed all aspects of the program may apply to the CNSC for certification as an exposure device operator.

## **Prerequisite Equivalencies**

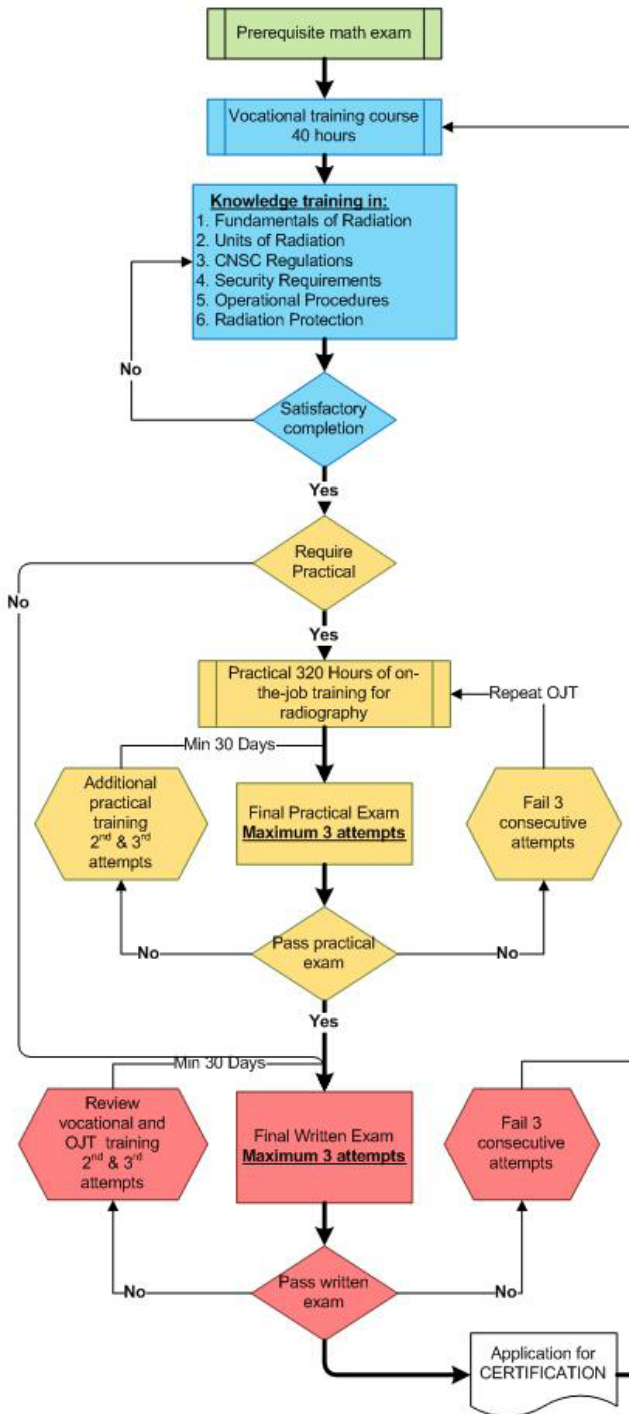
Upon the discretion of the CNSC, a candidate may demonstrate knowledge and experience to satisfy the training, skills and experience requirements as outlined above (i.e. CGSB Certification, RT 1, 2 & 3 Qualified Operator, Radiation Safety Officer, Emergency Responders, etc).

All information regarding certification that is submitted to the CNSC is considered a record under the control of the CNSC. The CNSC is bound by the *Access to Information Act* and the *Privacy Act* regarding access to federal government information by Canadian citizens.

# Exposure Device Operator Personnel Certification

## 2.5 Recommended Certification Path

TITLE  
**TYPICAL CERTIFICATION PATH FOR EXPOSURE DEVICE OPERATORS**



### Prerequisites

All applicants must show a basic knowledge of mathematics

### Step 1

Take specialized formal training in the practice and theory for industrial radiography. This may include transportation requirements and emergency response procedures. The training provider will determine the requirements for satisfactory completion of the course.

Will require proof of satisfactory completion of course including training facility details and course content.

### Step 2

Require 320 hours of OJT or apprenticeship. This may include transportation requirements and emergency response procedures.

### Step 3

Final written exam (comprised of multiple choice questions).

### Step 4

Submit all required documents and application fee to the CNSC.



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## EDO Training Program

It is important that the vocational and practical training programs meet the training needs of the learner in order to become certified as an exposure device operator. Ideally the vocational training program should consist of a minimum of a 40-hour classroom instructional program in radiation safety and regulation, with the theory of industrial gamma radiography forming the foundation for the practical knowledge and skills required to perform the job. It should include theory instruction covering the core principles, facts and explanations of gamma radiography delivered in a systematic manner. It should also include, at a minimum, the knowledge and skills requirements identified in this guidance document.

Although it is recommended that vocational training be completed prior to the start of on-the-job training, vocational training may also be started during the first few weeks of employment.

Based on a detailed job-task-analysis, the vocational training should take the following into account:

- Training is preparation for performance on the job. All vocational instruction should focus on the essential knowledge, skills, and abilities required to encourage a strong safety culture;
- Training shall be tailored to the needs and the learning characteristics of the target population, i.e. Exposure Device Operators and the gamma radiography industry. This must include knowledge details that are needed to best comprehend the certified EDO function;
- Training must include the relevant sections of the NSCA, its Regulations and applicable licence conditions
- What the student will learn in the classroom and what they will learn during on-the-job training;
- What knowledge is essential to understand operational concepts and how the learning will transfer to actual CEDO tasks;
- What instructional methodology will be used, including any required hands-on component, to increase understanding and application of skills;
- Documented learning objectives detailing the knowledge and skills that must be displayed following the classroom training as well as the objectives following the on-the-job training. The learning objectives should be derived from this guidance document and from the knowledge and skills requirements identified;
- The instructional technology that best supports the learning requirements;
- Any updates to training such as regulatory or operational requirements, safety improvements, changes to security or changes to technology;
- An examination or assessment plan that accurately determines if the student is attaining the knowledge and understanding required by a CEDO and is progressing toward achievement of final certification; and
- Documented training records including certificates of satisfactory completion signed by the authorized authority within the training organization. All records and certificates may be requested for audit purposes at any time by the CNSC in order to evaluate how the education program provided achieved its objectives and outcomes. The CNSC may require evidence that the required knowledge, skills and abilities have been attained by the EDO, through the process of performance-based assessment and program evaluation.

The EDO on-the-job training program plays a vital role in safe operations and skills development and should consist of a minimum of 320 hours of on-the-job training and instruction on the controlled use and operation of an exposure device. The trainee in this case must be under the direct supervision and

# Exposure Device Operator Personnel Certification

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observation of an experienced CEDO. This practical training should compliment and expand on the knowledge obtained from vocational training and provide hands-on practice and experience in order to attain the level of skill and ability required to be a CEDO. The training plan should be formally designed and documented with periodic assessment during the training delivery to ensure objectives and outcomes will be met.

The vocational and practical training components should be completed within two years of the start of the vocational training. Any EDO trainee who completes the components is eligible to take the practical and written examinations accepted by the CNSC. Any EDO who has satisfactorily completed all aspects of the program may apply to the CNSC for certification as an exposure device operator.

## On-the-job Training Program

As a minimum, it is recommended that candidates provide valid documentation demonstrating successful completion of on-the-job training (OJT) with a minimum of 320 hours as an EDO under the direct visual supervision of an authorized CEDO. Candidates are strongly encouraged to complete this requirement within two years. Documented training in the following areas as determined by a detailed job-task-analysis **assessment performed by experts identified by the Scheme Committee** must be completed by all candidates. (A checklist to be completed and signed off by the trainee supervisor or radiation safety officer (RSO) – Appendix B sample training record):

- Principles of operation of specific exposure devices and associated equipment;
- Supervised operation of specific exposure devices and associated equipment;
- Use of remote handling tools;
- Use of and requirements for personal dosimetry;
- Use of survey meters and conducting radiation surveys;
- Specific emergency recognition and mitigation procedures, including practical exercises;
- Risk analysis and job hazards assessment and prevention (occupational health & safety);
- Aspects of radiation protection and radiation safety principles;
- Principles of ALARA
- Application of action levels;
- Daily equipment checks, maintenance and operational procedures;
- Record keeping requirements;
- Quality control procedures (calibration and control of non-conforming equipment);
- Preparation of work area and establishment of radiation barriers and area control;
- Practical application of CNSC regulatory requirements;
- Handling of radioactive material
- Security of radioactive sources and devices (expectations, procedures);
- Responsibilities and obligations of workers, supervisors, RSOs and licensees;
- Job assessment and equipment selection and positioning;
- Familiarity with manufacturer's instructions;
- Basic leak testing procedures;
- Requirements for transport;
- CNSC compliance inspection and enforcement; and
- Human factors and practical applications pertaining to the work environment including the impact of substance abuse, fatigue and stress.

# Exposure Device Operator Personnel Certification

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## **Practical Examination**

The CNSC requires candidates to pass a practical examination as part of the certification process. The purpose of the practical examination is to determine whether candidates have acquired or maintained the knowledge, skills and abilities to operate an exposure device in a safe and secure manner.

Candidate must submit a copy of an Exposure Device Operator - Practical Exam (Appendix A) conducted at an NRCan test centre or conducted by a CEDO with a minimum of five years experience, and hands-on experience with the device being used in the testing:.

The person who administers the practical examination must be designated in writing by the RSO. The licensee is responsible for ensuring that the person who administers the practical examination meets the minimum requirements.

During the practical examination candidates must demonstrate competence in each of the following areas:

1. Radiation protection
2. Inventory control
3. Preparation of work area
4. Exposure device and accessories
5. Safe setup and use of exposure device
6. Post-exposure
7. Record keeping
8. Emergency preparedness
9. Transportation (if applicable)
10. Security

Re-exam attempts are permitted should the first practical exam attempt be unsuccessful. The candidate should wait a period of 30 days between examination attempts. EDO candidates, who fail three consecutive practical attempts, must repeat the on-the-job training program.

## **Written EDO Examination**

As part of the certification process, the CNSC requires candidates to submit evidence of the successful completion by the candidate of an examination recognized by the CNSC.

Re-exam attempts are permitted should the first written examination attempt be unsuccessful. The candidate should wait a period of 30 days between examination attempts. EDO candidates, who fail three consecutive written examination attempts, must repeat the vocational training program.

The written examination is the property of the CNSC. Any appeal to an examination result must be submitted to the CNSC.



# Exposure Device Operator Personnel Certification

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## 2.6 TRAINING RESOURCES

Courses are available through professional associations and may be available through private colleges or other training providers throughout Canada.

CSA Group, the CNSC and NRCan do not evaluate or endorse training organizations that offer exposure device vocational or practical training.

## 2.7 APPLICATION PROCESS

The application process to become a CEDO is on the CNSC website. Please visit [www.nuclearsafety.gc.ca](http://www.nuclearsafety.gc.ca) for more information.

## 2.8 APPLICATION FEES, PAYMENT AND REFUND POLICY

The application fees for certification of CEDOs is mandated by the *CNSC Cost Recovery Fees Regulations*. Please refer to the CNSC website at [www.nuclearsafety.gc.ca](http://www.nuclearsafety.gc.ca) for more information.

## 2.9 CERTIFICATION SCHEME MAINTENANCE AND REVIEW

CSA Group established and maintains a scheme committee that will meet annually to review the certification standard and address any issues regarding its application that may have been identified by industry stakeholders.

## 2.10 EXAMINATION ADMINISTRATION AND SCHEDULING

Please refer to the CNSC website at [www.nuclearsafety.gc.ca](http://www.nuclearsafety.gc.ca) for information regarding examination administration and scheduling.

## 2.11 EXAMINATION ELIGIBILITY

Please refer to the CNSC website at [www.nuclearsafety.gc.ca](http://www.nuclearsafety.gc.ca) for further information..

## 2.12 EXAMINATION LANGUAGE

The written EDO examination for the CNSC Certified Exposure Device Operator program is administered in English or French.

## 2.13 EXAMINATION SPECIAL ACCOMMODATION

The administration of the written examination may be modified to accommodate special needs at the request of the candidate. Supporting documentation must be submitted with the completed application. Please refer to the examination administrator for more information.

# Exposure Device Operator Personnel Certification

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## 2.14 PROCESSING TIME FOR AN EDO CERTIFICATION

The CNSC will make an effort to process an EDO application in a timely manner upon receipt of the fully completed form, payment and all required supporting documentation.

If the CNSC requires additional information, the applicant will be notified within a timely manner.

To avoid processing delays:

- Complete all fields clearly and accurately on the application form;
- Ensure that supporting documentation and method of payment is provided with the application;

With respect to re-certification, a complete application needs to be submitted to the CNSC a minimum of 60 days prior to expiry.

## 2.15 CERTIFICATE ISSUANCE

Each Certified Exposure Device Operator will be issued with a certificate and identification card indicating the expiration date of the certification.

## 2.16 REPLACEMENT OF CERTIFICATES

If a CEDO certificate is lost or damaged, a replacement may be obtained by completing and submitting a request for certificate replacement form to the CNSC. The form is available on the CNSC website ([www.nuclearsafety.gc.ca](http://www.nuclearsafety.gc.ca)).

## 2.17 CERTIFICATION PERIOD

The CNSC Exposure Device Operator certification is typically issued with a 5 year validity period.

## 2.18 CERTIFICATION MANAGEMENT

All certification information will be maintained in a CNSC registry of CEDOs. The registry will contain identification and certification information on each CEDO. It is the responsibility of the CEDO to maintain their current status and submit a new application before the certification expires. It is recommended that CEDOs notify the CNSC of any changes to their contact information.

## 2.19 REQUIREMENT FOR PROOF OF CEDO CERTIFICATION

A CNSC Inspector may request proof of certification at any time. The CEDO Card, when accompanied by the photo identification card issued by the NRCAN National NDT Certification Body bearing the same registration number, is evidence that the holder has been certified by the Canadian Nuclear Safety Commission pursuant to Section 25 of the *Nuclear Substances and Radiation Devices Regulations*.

# Exposure Device Operator Personnel Certification

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## 2.20 REGULATORY COMPLIANCE AND ENFORCEMENT

Certified Exposure Device Operators must comply with the regulatory requirements that have been established under the NSCA and other legally binding instruments, such as regulations, licences and certifications that relate to the possession or use of exposure devices.

CEDOs are expected to maintain security of the source and device at a place where, or vehicle in which the source or device is located. CEDOs are expected to conduct themselves in a professional manner to protect the environment, maintain security and protect the health and safety of persons from any risk associated with the possession or use of a nuclear substance or exposure device under their control.

**CEDOs are expected to be aware of all laws relating to their activities, and to comply with these laws as they may change from time to time. These laws include offences related to the following:**

- **knowingly make a false or misleading written or oral statement to the CNSC;**
- **failure to comply with an order of the CNSC;**
- **failure to assist or give information to a CNSC inspector when requested to do so;**
- **interference with the performance of a CNSC inspector's duties;**
- **taking disciplinary action against a person who assists or gives information to the CNSC;**
- **falsifying a record kept pursuant to regulatory or certification requirements; or**
- **failure to comply with the NSCA or any of its regulations.**

The CNSC has various compliance and enforcement measures that it can use to promote, assure and verify compliance.

Non-compliance may result in the issuance of stop work orders, decertification, administrative monetary penalties or prosecution.

## 2.21 NON-DISCRIMINATION

Participation in the CNSC personnel certification programs is open on a non-discriminatory basis to all individuals and does not require membership in any association.

## 2.22 CONFIDENTIALITY

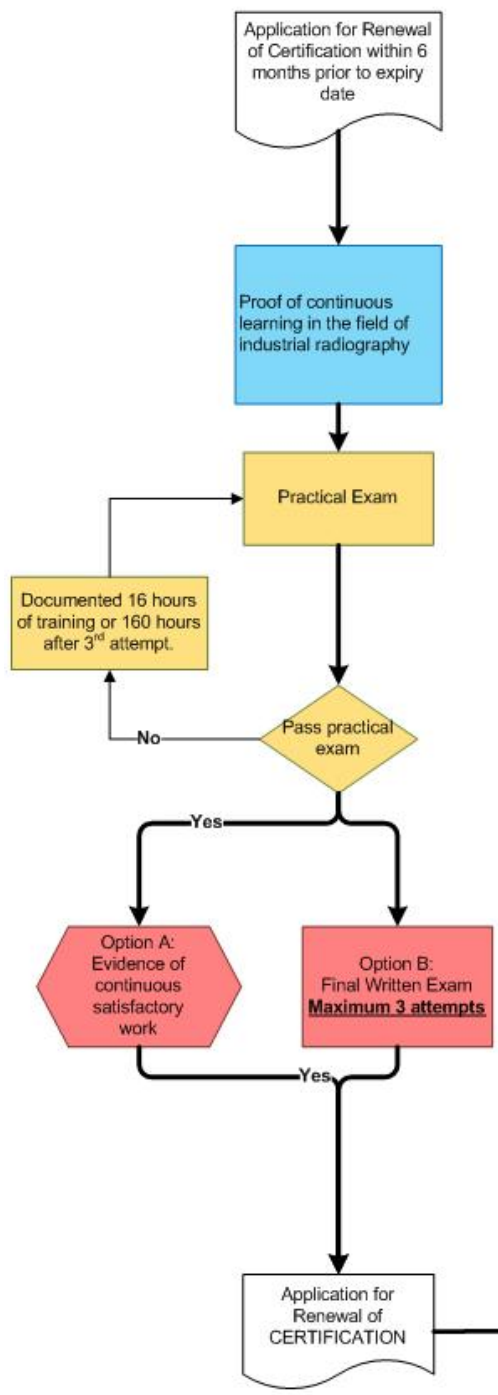
All information regarding certification by the CNSC is considered a record under the control of the CNSC. The CNSC is bound by the *Access to Information Act* and the *Privacy Act*.

# Exposure Device Operator Personnel Certification

## 2.23 CERTIFICATION RENEWAL

TITLE

### TYPICAL RENEWAL OF CERTIFICATION PATH FOR EXPOSURE DEVICE OPERATORS



#### Step 1

Requirements for Renewal of Certification must include proof of 40 hours of continuous education or learning at a minimum of 5 hours in a given year. Can be OJT or classroom and must be specific to the domain of radiography.

Subject matter can include but not limited to:

- Conferences
- Security training
- Safety training
- Regulatory updates
- Device/Technology information updates
- CNSC specific requirements

#### Step 2

Practical exam authorized by:

- RSO with 5 year experience plus 2 years as a CEDO, or
- CEDO with 5 years experience
- Authorized NRCan employee

Failure to pass the practical exam on first attempt requires documented 16 hours of additional on-the-job training before the 2<sup>nd</sup> and 3<sup>rd</sup> attempts to successfully pass the practical exam.

Failure to pass the practical exam following 3 attempts requires an additional 160 hours of OJT.

#### Step 3

##### Option A:

Document evidence of continuous work over the five-year term with any single period of non-work in industrial radiography not to exceed 12 months and:

- 320 hours of work as a CEDO in the previous 2 years, or
- Continuous satisfactory work as an RSO, supervisor of CEDOs, training of CEDOs or an emergency responder

##### Option B:

- Successfully challenge the written CEDO exam

#### Step 4

Submit all required documents and application fee to the CNSC.



# Exposure Device Operator Personnel Certification

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Exposure Device Operator certifications will expire every five years. A CEDO may recertify by:

1. Submitting a completed application form within 6 months, but no later than 60 days, prior to expiry;
2. Providing documentation (Appendix C) of a minimum of 40 hours of continuous learning/education either on-the-job or classroom over the five year period with a minimum of 5 hours per year. Acceptable training must be specific to the field of industrial radiography and use of an exposure device including, but not limited to the following:
  - a. Security;
  - b. Safety;
  - c. Regulations;
  - d. Technical developments and industry changes; and
  - e. CNSC updates or changes
3. Providing documentation of successful completion of an Exposure Device Operator – Practical Examination (Appendix A). This must be signed off by a person at an NRCan test centre or by a CEDO with a minimum of five years' experience, and hands-on experience with the device being used in the testing:

The person who administers the practical examination must be designated in writing by the RSO. The licensee is responsible for ensuring that the person who administers the practical examination meets the minimum requirements.

4. Providing evidence of continuous work, as follows:
  - a. Satisfactory work as a CEDO over the five-year term with any single period of non-work in industrial radiography not to exceed 12 months. A CEDO must show a minimum of 320 hours of work as a CEDO in the previous two years; or
  - b. Continuous satisfactory work as an RSO, supervisor of CEDOs, trainer of CEDOs or an emergency responder over the previous five years with any single period of work not related to CEDOs not to exceed six months. Work activity may include selections of the following:
    - i. Training
    - ii. Field work as a CEDO;
    - iii. Operations, supervision;
    - iv. RSO;
    - v. Inspection;
    - vi. Auditing; and
    - vii. Radiography program

NOTE: If unable to meet the requirements of a or b, the CEDO may challenge the written exam. Successful exam completion will satisfy this requirement.

5. Submit all required fees.

# Exposure Device Operator Personnel Certification

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If the candidate does not pass the certification renewal practical examination on the first attempt, the CNSC requires an additional 16 hours of on-the-job training (documented on the on-the-job Training Plan) before the second practical examination attempt.

## 2.24 REVOCATION OR SUSPENSION OF A CERTIFICATION

As per the *Nuclear Substances and Radiation Devices Regulations*, any CEDO who receives notice of a proposed decision to decertify, the operator can request an opportunity to be heard either orally or in writing. A certified exposure device operator, on being notified of a decision to decertify, shall immediately surrender to the Commission the CEDO certificate and identification card.

Upon a notice of termination of an Exposure Device Operator certification, the individual will immediately cease all use of or reference to the CNSC certification and the Certified Exposure Device Operator designation. Individuals have the right to appeal as outlined in the appeals process (2.27 Appeals, Complaints and Disputes).

## 2.25 VOLUNTARY WITHDRAWAL OF CERTIFICATION

Individuals wishing withdrawal of the Exposure Device Operator Certification should submit a notice in writing to the CNSC that includes their certificate. Once received, the individual will be removed from the CEDO Registry and must immediately cease any use of or reference to the CNSC certification

Individuals wishing to reinstate their certification must apply for certification as outlined in the certification process.

## 2.26 REFUSAL TO CERTIFY

The CNSC shall notify a person who has applied for certification as an exposure device operator of a proposed decision not to certify the person, as well as the basis for the proposed decision, at least 30 days before refusing to certify the person. The notice shall include a description of the person's right to be provided with an opportunity to be heard in accordance with established CNSC procedures.

## 2.27 FEEDBACK ON THE PERSONNEL CERTIFICATION GUIDE

**Any comments, suggestion or complaints with respect to the process and procedures described in CSA PCP-09, should be sent to the Certification Designated Officer at the CNSC.**

# Examination Preparation and Completion

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## 3.1 GENERAL DESCRIPTION

The CNSC Exposure Device Operator certification examination consists of approximately 150 multiple-choice questions. Examination questions have only one correct answer. Each examination question is independent and does not rely on the correct answer to any other questions.

The CNSC may include up to 10 additional questions in the examination for statistical evaluation of future examination questions. These additional questions are not included as part of the examination score. These questions will not be identified in the exam, so it is important that the candidate answer every question completely. The candidate's grade is based on the number of scored items answered correctly.

The candidate will have three hours (180 minutes) to complete the examination. Examinations are closed book. No reference materials may be used during the course of the examination. Any needed references, including mathematical formulas, will be provided to the test candidate the day of the examination.

## 3.2 EXAMINATION CONTENT

The examination will be based on six areas of study determined from the detailed knowledge and skills requirements:

### 1. Fundamentals of Radiation and Radioactivity

Understanding the differences between radiation and radioactivity will not only help understand some of the differences and physical aspects of electromagnetic and particle radiation, but also allow a CEDO to make risk-informed decisions on using different devices and the importance of personal exposure limitation. CEDO's are responsible for high-risk radioactive sources and must have an understanding of the hazards and effects of radiation (both acute and chronic) as well as some of the characteristics such as half-life, energy levels and scatter radiation for the types of sealed sources and shielding used in industrial radiography.

### 2. Units of Radiation Detection and Measurement

Accurate detection and measurement of radiation from normal background, as well as the sealed sources and devices used in industrial radiography, are essential to ensure safe operations in the work environment. The CEDO must understand and verify the calibration requirements and operational characteristics of all the radiation detection instruments needed for industrial radiography. In addition, a CEDO must be able to do the following:

- Identify how to use and select the proper radiation detection equipment;
- Identify some of the factors that will affect the operation of radiation detection equipment;
- Identify the proper method for wearing personal dosimetry devices;
- Identify the measurement units and conversion of various radiation detection equipment (Imperial vs. SI);
- Identify how to interpret radiation detection readings;
- Identify how to calculate dose values given rate and time; and
- Identify the units that apply to a given measurement situation.

# Examination Preparation and Completion

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## 3. CNSC Regulatory Requirements

The CNSC regulates the certification and safe operation of industrial exposure devices, as well as the certification of exposure device operators. The regulatory requirements are directed at the safety and security of the exposure devices and sealed sources as well as the operators, other workers, the public and the environment. The following information is available from the CNSC's website at [www.nuclearsafety.gc.ca](http://www.nuclearsafety.gc.ca):

- The *Nuclear Safety and Control Act* describes the authority and responsibilities of the CNSC and the powers and authorities of inspectors;
- The *Nuclear Substances and Radiation Devices Regulations* describe the minimum requirements for dosimetry, instrumentation, radiation safety, specialized training, area radiation barriers, signage and record keeping;
- The transportation and packaging requirements are found in the *Packaging and Transport of Nuclear Substances Regulations*, as well as transportation guidance found in the International Atomic Energy Agency (IAEA) documents, and in the *Transportation of Dangerous Goods Regulations*;
- The requirements for radiation protection programs, radiation dose limits, labeling and record keeping are found in the *Radiation Protection Regulations*, as well as associated guidance documents; and
- The obligations of workers to licensees and safe work operations are contained in the *General Nuclear Safety and Control Regulations*.

With these CNSC regulations, the CEDO should be able to identify the following:

- The requirements for personal monitoring and radiation detection equipment;
- The scope of the authority and powers of CNSC inspectors;
- The responsibilities and obligations of exposure device operators;
- The results of non-compliance with the regulatory requirements;
- The regulatory obligations of trainee supervisors; and
- The regulatory obligations of licensees.

## 4. Security

The small size and easy portability of industrial radiography exposure devices make them very susceptible to loss, theft and damage. As a result, a CEDO must adhere to all the required security measures for any exposure device in their possession. The CNSC regulatory document *REGDOC 2.12.3, Security of Nuclear Substances: Sealed Sources* sets out the minimum physical security measures that must be implemented to prevent the loss, sabotage, illegal use, illegal possession or illegal removal of Category 1, 2 and 3 (*RS-G-1.9, Categorization of Radioactive Sources*) radioactive sealed sources. It is essential that CEDOs are able to do the following:

- Identify the regulatory requirements for handling and reporting incidents or unusual occurrences;
- Identify activities that require specific training, certification or authorization before performing;
- Identify the regulatory obligations for the security of radioactive sealed sources; and



# Examination Preparation and Completion

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- Identify the regulatory obligations for the security of radioactive sealed sources, use, storage and transport during operation.

## 5. Operational Procedures

CEDOs must not only comply with CNSC regulations, they must also follow the operational procedures as established by the licensee. Developing a clear understanding of how the proper inspection, care and maintenance of all tools, equipment and instruments associated with the use of exposure devices is a powerful prevention tool. These procedures may be specific to a licensee's work environment and will generally include the following:

- Pre-use or post-use inspection procedures for exposure devices and accessories;
- Proper handling, operation, care and control of industrial radiography exposure devices and accessories;
- Proper transportation and storage of industrial radiography exposure devices and accessories;
- Regulatory requirements for using certified devices;
- Minimum required emergency equipment;
- General content and use of the company-specific radiation safety manual;
- Prescribed records and documentation requirements;
- How to safely use the different types of positioning fixtures;
- Proper use of a collimator;
- Situations where maintenance and inspection are required;
- Responsibilities and limitations in emergency situations;
- Procedures to ensure isotopes are returned to their proper fully-shielded position; and
- Requirements for conducting a source exchange.

## 6. Radiation Protection

Radiation protection practices and a safety-based radiation protection program are invaluable to a CEDO. Working in an environment with well-established safety and security cultures will significantly reduce the risk of unplanned events. Optimization of the licensee's radiation protection program will assist in keeping radiation exposures to As Low As Reasonably Achievable (ALARA), taking economic and social factors into account. Radiation protection practices for the CEDO should address the following:

- How time, distance and shielding are used to limit exposure to radiation;
- Justification of radiography operations through efficient planning of exposures;
- Optimization of ALARA programs and use of action levels to achieve the highest protection under specific conditions;
- Methods for controlling and monitoring access to radiation areas, rooms or enclosures; and Promotion of strong safety and security cultures

# Examination Preparation and Completion

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## 3.3 PASS-FAIL STANDARD

The CNSC Exposure Device Operator certification examination passing standard is established utilizing standard psychometric guidelines and is determined using a criterion-reference technique. The pass value is established based on a predetermined standard of a minimal level of knowledge and skill required by a new CEDO. This predetermined standard is defined as the minimum score that would be expected from candidates who have the level of knowledge and skills needed to competently conduct their work responsibilities.

## 3.4 EXAMINATION DELIVERY

The CNSC Exposure Device Operator examination will be delivered by authorized proctors at testing centres throughout Canada.

## 3.5 EXAMINATION ATTEMPTS

The CNSC will permit the candidate to rewrite the examination should the first attempt at the written examination be unsuccessful. The candidate must wait a period of 30 days between examination attempts.

EDO candidates, who fail two consecutive re-write attempts, must repeat the vocational training program.

## 3.6 EXAMINATION GENERAL INSTRUCTIONS

During the examination, the proctor will be responsible for supervising the examination in such a way as to ensure that examination security is maintained. As such, all candidates are expected to adhere to authorized proctor guidelines during the test sessions.

The exam is a closed book exam. Reference materials, electronics, personal items and phones, will not be permitted in the exam room. Only a non-programmable calculator is permitted in the exam room. The exam centre will provide specific instructions to the candidate when the exam is scheduled.

A candidate's participation in any irregularities occurring during the examination, such as giving or obtaining unauthorized information or cheating, will be sufficient cause to terminate participation, invalidate the results of the examination, or other appropriate remedy.

## 3.7 ENVIRONMENT

Examination room temperature can be unpredictable; therefore, it is suggested that the candidate bring appropriate clothing (e.g. sweater or sweatshirt without pockets) to help to adapt to a cooler or warmer climate in the examination room. The candidate should bring ear plugs if he/she is sensitive to noise.

# Examination Preparation and Completion

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## 3.8 EXAMINATION SECURITY "VALIDITY OF THE EXAMINATION"

***It is important that access to examination questions be carefully controlled to ensure that examination results are valid and that no person taking the examination has an unfair advantage. Accordingly, questions and answers are protected by those entrusted with their possession including the CSA Group, NRCan and the CNSC. Measures will be taken to eliminate the possible inappropriate retention or copying of questions at all times, including when examinations are taken by CEDO candidates. Such measures include a variety of restrictions imposed on those wishing to take the examination and anyone not agreeing to such restrictions will be prohibited from taking the examination. Anyone found breaching any of the restrictions can face sanctions up to and including a decision not to grant a certification as an exposure device operator.***

All certification examination content and wording of examination questions constitute confidential information protected by copyright law. Any unauthorized receipt, possession, or transmission of examination questions, content, or copying of question by electronic means is strictly forbidden. Candidates must take no action to compromise the integrity or confidential nature of the exam and its contents.

The use of the official CEDO examination materials for the purpose of examination preparation or training is also forbidden.

CSA Group, NRCan and the CNSC reserves the right to take whatever measures are necessary to protect the integrity of its examinations. Violation of the CNSC / CSA Group examination agreement and/or non-disclosure agreement, or the giving or receiving of aid in any examination as evidenced either by observation at the time of the examination or by statistical analysis, or engaging in other conduct that subverts or attempts to subvert the examination or the certification process, is sufficient cause for the CNSC to:

- Bar an individual from the examination;
- Terminate participation in the examination;
- Withhold and/or invalidate the results of the examination;
- Withhold a certification;
- Revoke a certification; or
- Take appropriate other action.

## 3.9 EXAMINATION RESULTS NOTIFICATION

The candidate will receive official notification of the examination result from the testing agency. Candidates passing the examination and fulfilling all program requirements can then submit a completed EDO certification application to the CNSC.

# Examination Body of Knowledge and Blueprint

## 4.1 EXAMINATION REFERENCE DOCUMENTS

The Exposure Device Operator examination design draws on concepts included in the following standards and materials.

Publication	Fundamentals of Radiation	Detection, Measurement and Units	Regulatory Requirements	Security	Operation Procedures	Radiation Protection
Minister of Public Works and Government Services Canada. Canadian Nuclear Safety Commission. <b>Certification of Exposure Device Operators / Regulatory Guide G-229</b> . 2004. Print. < <a href="http://nuclearsafety.gc.ca/pubs_catalogue/uploads/G-229_E.pdf">http://nuclearsafety.gc.ca/pubs_catalogue/uploads/G-229_E.pdf</a> >.					•	
International Atomic Energy Agency. Division of Radiation and Waste Safety. <b>Code of Conduct on the Safety and Security of Radioactive Sources</b> . Vienna, Austria, 2004. Print. < <a href="http://www-pub.iaea.org/MTCD/publications/PDF/Code-2004_web.pdf">http://www-pub.iaea.org/MTCD/publications/PDF/Code-2004_web.pdf</a> >.				•		
Bush, Joe. <b>Gamma Radiation Safety Study Guide</b> . 2nd ed. ASNT, 2004. Print.	•				•	•
Canada. Minister of Justice. <b>General Nuclear Safety and Control Regulations</b> . 2008. Web. < <a href="http://laws-lois.justice.gc.ca/PDF/SOR-2000-202.pdf">http://laws-lois.justice.gc.ca/PDF/SOR-2000-202.pdf</a> >.		•	•	•	•	•
United States. Environmental Protection Agency. <b>Radiation Protection</b> . 2012. Web. < <a href="http://www.epa.gov/radiation/">http://www.epa.gov/radiation/</a> >.	•					•
International Atomic Energy Agency. <b>Categorization of Radioactive Sources / Safety Guide No. RS-G-1.9</b> . Vienna, Austria: IAEA, 2005. Print. < <a href="http://www-pub.iaea.org/MTCD/publications/PDF/Pub1227_web.pdf">http://www-pub.iaea.org/MTCD/publications/PDF/Pub1227_web.pdf</a> >.	•					
Canada. Atomic Energy Control Board. <b>Industrial Gamma Radiography: Study Guide for the Qualified Operator Examination</b> . 1989 reprinted 1992. Print.	•	•			•	•
Canada. Natural Resources Canada. <b>Industrial Radiography: Examination Guide for Initial Certification DOC.4-9-RT emc</b> . Ottawa, 2002, 3rd ed. Print. < <a href="http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/minerals-metals/files/pdf/mms-smm/ndt-end/pdf/rad-rad-eng.pdf">http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/minerals-metals/files/pdf/mms-smm/ndt-end/pdf/rad-rad-eng.pdf</a> >.	•					
Canada. Canadian Nuclear Safety Commission. <b>Keeping Radiation Exposures and Doses "As Low as Reasonably Achievable (ALARA)" / Regulatory Guide G-129, Revision 1</b> . Ottawa, 2004. Print.	•					•
Licence Condition					•	

# Examination Body of Knowledge and Blueprint

Publication	Fundamentals of Radiation	Detection, Measurement and Units	Regulatory Requirements	Security	Operation Procedures	Radiation Protection
Canada. Minister of Justice. <b>Nuclear Safety and Control Act</b> . Ottawa, 2012. Print. < <a href="http://laws-lois.justice.gc.ca/PDF/N-28.3.pdf">http://laws-lois.justice.gc.ca/PDF/N-28.3.pdf</a> >.			●		●	
Canada. Minister of Justice. <b>Nuclear Security Regulations SOR/2000-209</b> . Ottawa, 2010. Print. < <a href="http://laws-lois.justice.gc.ca/PDF/SOR-2000-209.pdf">http://laws-lois.justice.gc.ca/PDF/SOR-2000-209.pdf</a> >.			●			
Canada. Minister of Justice. <b>Nuclear Substances and Radiation Devices Regulations SOR/2000-207</b> . Ottawa, 2010. Print. < <a href="http://laws-lois.justice.gc.ca/PDF/SOR-2000-207.pdf">http://laws-lois.justice.gc.ca/PDF/SOR-2000-207.pdf</a> >.	●	●	●	●	●	●
Canada. Minister of Justice. <b>Packaging and Transport of Nuclear Substances Regulations SOR/2000-208</b> . Ottawa, 2011. Print. < <a href="http://lois.justice.gc.ca/PDF/SOR-2000-208.pdf">http://lois.justice.gc.ca/PDF/SOR-2000-208.pdf</a> >.			●	●		
Canada. Environmental Health Directorate. <b>Radiation Hazard Control in Industrial Radiography- Training Manual volume 2</b> . Department of National Health and Welfare, 1982. Print.	●	●				●
"Radiation Protection regulations, SOR/2000-203." <i>CanLII</i> . Canadian Legal Information Institute, 31 AUG 2012. Web. 7 Sep 2012. < <a href="http://www.canlii.org/en/ca/laws/regu/sor-2000-203/latest/sor-2000-203.html">http://www.canlii.org/en/ca/laws/regu/sor-2000-203/latest/sor-2000-203.html</a> >.		●	●		●	●
<b>Radiation Safety Training, Part 1, Student Workbook</b> . Lake Oswego: Rudarmel Enterprises Inc. (Formerly QCC-NDT), 1994. Print.	●					
Canada. Canadian Nuclear Safety Commission. <b>REGDOC-2.12.3, Security of Nuclear Substances: Sealed Sources</b> . Ottawa: Canadian Nuclear Safety Commission, 2012. Print. < <a href="http://nuclearsafety.gc.ca/eng/pdfs/Draft-RD-GD/DRAFT-RDGD-338-Security-Measures-for-Sealed-Sources_e.pdf">http://nuclearsafety.gc.ca/eng/pdfs/Draft-RD-GD/DRAFT-RDGD-338-Security-Measures-for-Sealed-Sources_e.pdf</a> >.				●		
"Sentinel 880 Series Source Projector Operating and Maintenance Manual." MAN-027. Burlington: QSA Global, 2011. Print. < <a href="http://www.sentinelndt.com/LinkClick.aspx?fileticket=McQRljntP0w=&amp;tabid=80">http://www.sentinelndt.com/LinkClick.aspx?fileticket=McQRljntP0w=&amp;tabid=80</a> >					●	
"Transport Canada. Transportation of Dangerous Goods Regulations SOR/2011-210" <i>Transport Canada</i> . Government of Canada, 10 MAR 2012. Web. 7 Sep 2012. < <a href="http://www.tc.gc.ca/eng/tdg/clear-tofc-211.htm">http://www.tc.gc.ca/eng/tdg/clear-tofc-211.htm</a> >.				●	●	
McGuire, Stephen, and Carol Peabody. United States. Office of Nuclear Regulatory Research U.S. Nuclear Regulatory Commission. <b>Working Safely in Gamma Radiography NUREG/BR-0024</b> . Washington, D.C.: Office of Nuclear, 1982. Print. < <a href="http://pbadupws.nrc.gov/docs/ML1028/ML102871150.pdf">http://pbadupws.nrc.gov/docs/ML1028/ML102871150.pdf</a> >.	●	●			●	●

# Examination Body of Knowledge and Blueprint

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## 4.2 INDUSTRY DEFINITIONS AND ACRONYMS

There are a number of words throughout this program that are common to the nuclear industry. The following definitions apply to this document:

- **Certificate:** means a document issued by the Commission or by a Designated Officer authorized under paragraph 37(2)(a) or (b) of the Nuclear Safety and Control Act, indicating that prescribed equipment or a person is certified.
- **Certified:** means certified by the Commission under paragraph 21(1)(h) or (i) of the Act or by a Designated Officer authorized under paragraph 37(2)(a) or (b) of the Act.
- **Certified exposure device operator (CEDO):** refers to the individual who has training and experience in the use and operation of a certified exposure device and has successfully completed examinations recognized by the CNSC.
- **CGSB:** means Canadian General Standards Board.
- **CNSC:** means the Canadian Nuclear Safety Commission. The CNSC was established by section 8 of the *Nuclear Safety and Control Act* and regulates the development, production and use of nuclear energy and the production, possession and use of nuclear substances, prescribed equipment and prescribed information.
- **CSA:** means Canadian Standards Association.
- **Dosimeter :** means a device for measuring a dose of radiation that is worn or carried by an individual.
- **Exposure device:** means a radiation device that is designed for carrying out gamma radiography, and includes any accessory to the device such as a sealed source assembly, a drive mechanism, a sealed source assembly guide tube and an exposure head.
- **Exposure device operator trainee (EDO):** refers to the individual who is being trained as an exposure device operator and is under the direct supervision of a certified exposure device operator.
- **IAEA:** means the International Atomic Energy Agency. The IAEA is an independent international organization related to the United Nations system. Located in Vienna, it works with its member states and multiple partners worldwide to promote safe, secure and peaceful nuclear technologies.
- **Licensee:** a person who is licensed to carry on an activity described in any of the paragraphs 26 (a) to (f) of the Nuclear Safety and Control Act.
- **NSCA:** means the Nuclear Safety and Control Act.
- **NRCan:** means Natural Resources Canada.
- **Operate:** this includes, in respect of an exposure device, coupling the drive mechanism to the exposure device, uncoupling the drive mechanism from the exposure device, locking or unlocking the exposure device, and all activities involving the device that take place while the sealed source assembly is not locked inside the device in the fully shielded position.
- **RSO:** means Radiation Safety Officer.

## Examination Body of Knowledge and Blueprint

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- Safety Culture: as described by the IAEA, this refers to the assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance.”
- Sealed source: a radioactive nuclear substance in a sealed capsule or in a cover to which the substance is bonded, where the capsule or cover is strong enough to prevent contact with or the dispersion of the substance under the conditions for which the capsule or cover is designed.
- Security Culture: as described by the IAEA; this refers to the assembly of characteristics, attitudes and behavior of individuals, organizations and institutions which serves as a means to support and enhance nuclear security.
- Survey meter: a hand-held instrument that is capable of measuring radiation dose rates.

# Examination Body of Knowledge and Blueprint

## 4.3 EXAMINATION BLUEPRINT

A group of industry experts developed the following examination objectives. The weighting of each objective was determined through industry survey. This list outlines the knowledge and skills required for each objective.

**Section Name** Percentage % of Examination

<b>1</b>	<b>Fundamentals of Radiation and Radioactivity</b>	<b>10%</b>
1.1	Define radioactivity.	
1.2	Identify physical aspects of radioactivity.	
1.3	Identify the types of radiation.	
1.4	Identify measurement of activity.	
1.5	Identify characteristics of scatter radiation.	
1.6	Identify the concept of electromagnetic radiation.	
1.7	Identify the half-life and relative energy levels of various isotopes used in radiography.	
1.8	Recognize high-risk sources of radiation.	
1.9	Recognize the hazards and effects of radiation.	
1.10	Identify acute and chronic effects of radiation on humans.	
<b>2</b>	<b>Detection, Measurement and Units</b>	<b>14%</b>
2.1	Identify how to use calibrated radiation detection equipment.	
2.2	Given a situation, select the proper measurement tool.	
2.3	Identify the proper frequency of calibration and verification of detection equipment.	
2.4	Identify the factors that will affect the operation of radiation detection equipment.	
2.5	Identify the proper method for wearing detection devices.	
2.6	Identify how to ensure radiation detection equipment is performing within specifications.	
2.7	Identify the measurement units of various detection equipment.	
2.8	Identify how to read and interpret detection equipment.	
2.9	Identify how to perform unit conversions.	
2.10	Given a scenario including dose rate and time, calculate the dose values.	
2.11	Identify when unit conversion is necessary.	
2.12	Identify the units which apply to a given measurement situation.	
<b>3</b>	<b>Regulatory Requirements</b>	<b>16%</b>
3.1	Identify the mandatory personal monitoring equipment.	
3.2	Identify where and when survey meters must be used.	
3.3	Identify the scope of the authority and accessibility of CNSC inspectors.	
3.4	Identify the responsibilities and obligations of operators with respect to regulations.	
3.5	Identify the results of non-compliance with the regulatory requirements.	
3.6	Identify the dose limits outlined by the regulatory requirements.	
3.7	Identify the regulatory obligations of trainee supervisors.	
3.8	Identify the regulatory obligations of licensees.	
3.9	Identify regulations governing the preparation of radioactive materials for transportation.	
3.10	Identify the regulatory requirements for record keeping.	



# Examination Body of Knowledge and Blueprint

<b>4</b>	<b>Security</b>	<b>20%</b>
4.1	Identify the regulatory requirements for reporting incidents or unusual occurrences.	
4.2	Identify activities that require specific training, certification or authorization before performing.	
4.3	Identify the regulatory obligations for the security of radioactive materials during storage.	
4.4	Identify the regulatory obligations for the security of radioactive materials during transportation.	
4.5	Identify the regulatory obligations for the security of radioactive materials during operation.	
4.6	Identify the procedures for handling unplanned occurrences.	
<b>5</b>	<b>Operation Procedures</b>	<b>20%</b>
5.1	Identify the pre-use or post-use inspection procedures for exposure devices and accessories.	
5.2	Identify the proper handling of industrial gamma radiography exposure devices and accessories.	
5.3	Identify the proper transportation and storage of industrial gamma radiography exposure devices and accessories.	
5.4	Identify the proper operation of industrial gamma radiography exposure devices and accessories.	
5.5	Identify the requirements for using certified devices.	
5.6	Identify the minimum required emergency equipment.	
5.7	Identify the general content and use of the company-specific radiation safety manual.	
5.8	Identify the prescribed records and documentation requirements.	
5.9	Identify different types of positioning fixtures and how to safely use them.	
5.10	Given a situation, including an abnormal operation of a device, identify how to respond.	
5.11	Identify situations where maintenance/inspection is required.	
5.12	Identify responsibilities and limitations in emergency situations.	
5.13	Identify the survey practice that will ensure isotopes are returned to their proper fully-shielded position.	
5.14	Identify the requirements for conducting a source exchange.	
<b>6</b>	<b>Radiation Protection</b>	<b>20%</b>
6.1	Identify how time distance and shielding impact exposure to radiation.	
6.2	Identify the situational requirements for surveying a given controlled location.	
6.3	Given a scenario with time, distance, or shielding, calculate dose levels.	
6.4	Identify the intent of A.L.A.R.A.	
6.5	Identify resources for controlling and monitoring access to given radiation areas, rooms or enclosures.	

# Appendix A – Exposure Device Operator – Practical Examination

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## **A. 1 PRACTICAL EXAMINATION**

The Exposure Device Operator practical examination draws on concepts included in the vocational training and on-the-job training completed by the applicants as guided by the referenced standards and materials listed in this guide.

The following practical examination sample may be used for documenting the deployment of practical examinations for submission to the CNSC as part of the application process. Licensees may use this template or set up their own for submission.

## Exposure Device Operator – Practical Examination

Candidate (Full Legal Name):		Date:
EDO Ref #:		D.O.B.:
Location:		Page   1

ALL sections or subsections identified by a (\*) are MANDATORY requirements of the practical examination.

1. Radiation Protection (6 Points)	Value	Fail (X)	Pass (V)	Examiner's Initials	Expectations
<input type="checkbox"/> *Has Direct reading dosimeter, audible dosimeter, dosimeter issued by licensed dosimetry service, and radiation survey meter in possession	1.0				As per CNSC Regulations the EDO must show that they are knowledgeable of and have the ability to properly operate all instruments and equipment
<input type="checkbox"/> *Turned on alarming dosimeter and survey meter before starting	1.0				
<input type="checkbox"/> *Ensure power level of batteries are sufficient for operation	1.0				
<input type="checkbox"/> *Equipment checked for valid calibration dates	1.0				
<input type="checkbox"/> *DRD was zeroed prior to start or ensure a minimum of 2 mSv (200 mR) total dose range	1.0				
<input type="checkbox"/> *Continuity/Function check for radiation detection equipment	1.0				
2. Inventory Control (4 Points)	Value	Fail (X)	Pass (V)	Examiner's Initials	Expectations
<input type="checkbox"/> Proper sign out of the exposure device	1.0				Demonstrate the importance of accurate documentation control and record keeping
<input type="checkbox"/> *Proper survey and recording for surface dose rates on the exposure device. (<2 mSv/hr)	1.0				
<input type="checkbox"/> Use of all required daily records required by licensee	1.0				
<input type="checkbox"/> Ensure that emergency equipment is available and in working condition	1.0				
3. Prepare Work Area (5 Points)	Value	Fail (X)	Pass (V)	Examiner's Initials	Expectations
<input type="checkbox"/> Initiates Job hazard assessment (JHA) of work area	1.0				Demonstrate safety and security when preparing work area
<input type="checkbox"/> Broken or deficient equipment is quarantined (may be done orally)	1.0				
<input type="checkbox"/> *Post sufficient # of signs and barriers to prevent entry into area	1.0				
<input type="checkbox"/> *Evacuate persons from the controlled area	1.0				
<input type="checkbox"/> All equipment has been safely placed to prevent any incidents	1.0				

## Exposure Device Operator – Practical Examination

<b>Candidate:</b>		<b>Date:</b>
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4. Device (Choose one Device Type only) (11 Points)	Value	Fail (X)	Pass (V)	Examiner's Initials	Expectations
<u>Cable Drive Devices</u>					
<input type="checkbox"/> *Use of survey meter during equipment assembly for operation	1.0				
<input type="checkbox"/> *Equipment checks prior to operation:	1.0				
<ul style="list-style-type: none"> <li>▪ Device checks – Company contact labels (name/phone #), source tag, trefoil radiation label, Fasteners, locking mechanism, shipping plug/safety, and cover protective covers.</li> </ul>	1.0				
<ul style="list-style-type: none"> <li>▪ Remote control checks– handle, fittings, brake, fasteners, protective covers and inspect the length for cuts, dents, or damage</li> </ul>	1.0				
<ul style="list-style-type: none"> <li>▪ Remote control drive cable checks – free movement, flex test, visual check for fraying, kinks, or corrosion</li> </ul>	1.0				The EDO must demonstrate a good basic understanding of the devices being used.
<ul style="list-style-type: none"> <li>▪ Head hose/guide tube – Checks fittings, connectors, threads, source stop and length of conduit for dents, cuts, damage or debris that may affect safe operation</li> </ul>	1.0				
<ul style="list-style-type: none"> <li>▪ Source assembly (go/no go gauge-if applicable)</li> </ul>	1.0				
<input type="checkbox"/> Collimator and/or effective use of shielding used.	1.0				They must be able to take accurate radiation measurements during setup and conduct all the necessary equipment checks.
<input type="checkbox"/> Demonstrates ability to connect the remote controls, the guide tube, collimator and device together to prepare for an operation.	1.0				
<input type="checkbox"/> Knowledge of use of transportation overpack and use.	1.0				
<input type="checkbox"/> Knowledge of emergency equipment requirements	1.0				
<u>Pneumatically Operated Devices</u>					
<input type="checkbox"/> *Use of survey meter during equipment assembly for operation	1.0				Failure to conduct these required checks could result in a serious unplanned event.
<input type="checkbox"/> *Equipment checks prior to operation:	1.0				
<ul style="list-style-type: none"> <li>▪ Device checks – Company contact label (name/phone #) source tag, trefoil radiation label, Fasteners, locking mechanism, shipping plug/safety, and cover protective covers</li> </ul>	1.0				
<ul style="list-style-type: none"> <li>▪ Checks on controls/pump – free movement, drive cable visual check for fraying, kinks, damage, handle, fittings, dummy source movement, screws, cuts, dents, brake, protective covers, pump leakage, cuts</li> </ul>	1.0				

## Exposure Device Operator – Practical Examination

<b>Candidate:</b>		<b>Date:</b>
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<input type="checkbox"/> Push/pull length & flex test	1.0				
<input type="checkbox"/> Spring length (end coiled over) & kinks	1.0				
<input type="checkbox"/> Guide tube – cuts, protective covers, dents, threads, source stop connection	1.0				
<input type="checkbox"/> Collimator and/or shielding used.	1.0				
<input type="checkbox"/> *Demonstrates ability to connect the pump, the head hose, collimator and device together in the correct order to prepare for an operation.	1.0				
<input type="checkbox"/> Knowledge of emergency equipment requirements	1.0				
<input type="checkbox"/> Shipping plug/safety cover, device lock	1.0				
<b>5. Operation (10 Points)</b>	<b>Value</b>	<b>Fail (X)</b>	<b>Pass (√)</b>	<b>Examiner's Initials</b>	<b>Expectations</b>
<input type="checkbox"/> *Proper use of survey meter	1.0				This is the most important part of the work process. The EDO must demonstrate proper control of the high risk source and device to ensure safety and security at all times.
<input type="checkbox"/> *Unlock and safely connect the exposure device and associated equipment in the correct order according to the manufacturer's specification.	1.0				
<input type="checkbox"/> *Exposing the source	1.0				
<input type="checkbox"/> *Verify barrier dose rates and radiation warning sign positions on first exposure using the survey meter	1.0				
<input type="checkbox"/> *Retract source	1.0				
<input type="checkbox"/> *Observation of survey meter and alarming dosimeter during source movement	1.0				
<input type="checkbox"/> Observation of proper operation and location of source position indicator (cable drive only)	1.0				
<input type="checkbox"/> *After each attempt to move the sealed source assembly to the shielded position within the exposure device, use a radiation survey meter to ensure that the source assembly has returned to the safe shielded position	1.0				
<input type="checkbox"/> Verify that operational procedures are followed	1.0				
<input type="checkbox"/> Implementation of ALARA and basic radiation protection principles.	1.0				

## Exposure Device Operator – Practical Examination

<b>Candidate:</b>		<b>Date:</b>
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6. Post Exposure (8 Points)	Value	Fail (X)	Pass (v)	Examiner's Initials	Expectations
<input type="checkbox"/> *Survey post exposure	1.0				The EDO must show how to secure the device and verify the safety of the worksite in the proper order.
<input type="checkbox"/> *Ensure the safety lock indicates that the source is locked and in safe position (may not be applicable for some devices)	1.0				
<input type="checkbox"/> *Disassemble the equipment in the correct order according to the manufacturer's specifications	1.0				
<input type="checkbox"/> *Install retaining plug and/or port cover/cap	1.0				
<input type="checkbox"/> *Secure and lock the exposure device, properly store with protective covers and caps	1.0				
<input type="checkbox"/> Final site survey sweep	1.0				
<input type="checkbox"/> *Removal of posted radiation warning signs and barriers	1.0				
<input type="checkbox"/> Sign exposure device back in to secure storage area	1.0				
7. Record Keeping (5 Points)	Value	Fail (X)	Pass (v)	Examiner's Initials	Expectations
<input type="checkbox"/> Documented sign out device (dates/locations of use)	1.0				Maintaining accurate records is a regulatory requirement. The EDO must show how to properly record all radiation readings as well as the results of equipment checks.
<input type="checkbox"/> Documented survey reading on surface of device	1.0				
<input type="checkbox"/> Documented all equipment checks required by licensee	1.0				
<input type="checkbox"/> DRD readings	1.0				
<input type="checkbox"/> Trainee supervisor consent form	1.0				
8. Emergency Preparedness (oral examination) (6 Points)	Value	Fail (X)	Pass (v)	Examiner's Initials	Expectations
<input type="checkbox"/> *Recognize an emergency situation	1.0				The EDO must explain how to identify different emergency or dangerous occurrences and describe the process for mitigation.
<input type="checkbox"/> *Knowledge of required emergency equipment and location	1.0				
<input type="checkbox"/> *Knowledge of location emergency procedures	1.0				
<input type="checkbox"/> *Knowledge of initial emergency steps	1.0				
<input type="checkbox"/> *Proper use of Long Handled Tongs and shielding material	1.0				
<input type="checkbox"/> *Knowledge of correct contact information	1.0				



## Appendix B - EDO On-the-job Training Plan

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### **B. 1 EXPOSURE DEVICE OPERATOR – ON-THE-JOB TRAINING PLAN**

The Exposure Device Operator on-the-job training must be completed by the applicants as guided by the referenced standards and reference materials listed in this guide.

The following training plan sample may be used for documenting the deployment of OJT for submission to the CNSC as part of the application process. Licensees may use this template or set up their own for submission.



# EDO On-the-job Training Plan

<b>Candidate:</b>		<b>Date:</b>	
(Print Full Legal Name)		<b>EDO Ref. #:</b>	
<b>Location:</b>		<b>D.O.B. :</b>	

<b>CEDO Certification Training Plan</b>				
Candidate must provide documentation of successful completion of on-the-job training (OJT) with a minimum of 320 hours as an EDO under the direct visual supervision of an experienced CEDO. Documented training in the following areas (checklist to be completed and signed off by the training supervisor and radiation safety officer (RSO):	# Hours	Date Completed	Supervisor Initials	RSO Initials
1. Principles of operation of specific exposure devices and associated equipment				
2. Supervised operation of specific exposure devices and associated equipment				
3. Use of remote handling tools				
4. Use of and requirements for personal dosimetry				
5. Use of survey meters and conducting radiation surveys				
6. Specific emergency recognition and mitigation procedures, including practical exercises				
7. Risk analysis and job hazards assessment and prevention (occupational health & safety)				
8. Aspects of radiation protection and radiation safety principles;				
9. Principles of ALARA (As Low As Reasonably Achievable – time, distance, shielding, exposure control)				
10. Application of action levels				
11. Daily equipment checks, maintenance and operational procedures				
12. Record keeping requirements				
13. Quality control procedures (calibration and control of non-conforming equipment)				
14. Preparation of work area and establishment of radiation barriers and area control				
15. Practical application of CNSC regulatory requirements;				
16. Handling of radioactive sources and devices				

Candidate:		Date:	
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# EDO On-the-job Training Plan

CEDO Certification Training Plan (cont)				
17. Security of radioactive sources and devices (expectations, procedures)				
18. Responsibilities and obligations of workers, supervisors, RSOs and licensees				
19. Job assessment and equipment selection and positioning				
20. Familiarity with manufacturer's instructions				
21. Leak testing procedures				
22. Requirements for transport				
23. CNSC compliance inspection and enforcement				
24. Human factors and practical applications pertaining to the work environment including the impact of substance abuse, fatigue and stress				

Candidate:		Date:
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# Appendix C - Continuing Education

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## C. 1 EXPOSURE DEVICE OPERATOR – CONTINUING EDUCATION

The Exposure Device Operator continuing education (CE) must be completed by the applicants as guided by the referenced standards and reference materials listed in this guide.

The following form sample may be used for documenting the completion of training for submission to the CNSC as part of the re-certification process. Licensees may use this template or set up their own for submission.

### Instructions

Pursuant to the Certified Exposure Device Operator Certification Guidebook, Certified EDOs may achieve renewal through:

1. **Work Hours** – requires a CEDO to submit evidence of continuous work as an EDO over the five-year term with any single period of non-work (in industrial radiography) not to exceed 12 months. Must show a minimum 320 hours of work in the previous 2 years;
2. **Practical Exam** – requires the candidate to submit evidence of successfully completing a practical examination; and
3. **Continuing Education** – requires the candidate to submit a record of CE activities related to EDO activities over the five (5) year certification term (minimum of 5 hours per year for at least 40 hours total).

The following log may be used for documenting CEs for submission to the CNSC as part of the renewal process. Licensees may use this template or set up their own for submission.

### General Guidelines for Earning Continuing Education (CE) Activities:

- CE activities shall be related to specific to the field of industrial radiography and use of an exposure device.
- Each activity shall be a minimum of 0.25 hours (15 minutes).
- Each clock hour equals one CE Activity hour. Do not include time for breaks or lunch.
- Examples of CE activities include: conferences, workshops, seminars, employee in-services, formal courses (site-based or web based) at college or university, and independent study.
- No single activity can account for more than 50% of your total hours.

Proof of attendance or publication is required. This may include a certificate of attendance or signature of supervisor/manager. All activities are subject to audit by CNSC.

# Appendix C - Continuing Education

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## **Categories of Credit and Guidelines:**

### **1. College or University courses:**

Course must be applicable to industrial radiography and may include distance education courses. Generally, college or university courses run for one semester (4 months) and each course is equal to 36 CE hours. If you are unsure of the hours allowed for a course, calculate one CE for every clock hour you spend attending the course.

### **2. Conferences, seminars, workshops:**

Calculate the total hours attended, not including lunch or breaks (it is not necessary to break down every individual conference session attended).

### **3. Employee in-services:**

Only sessions of .0.25 hours (15 minutes) or greater are eligible. Keep a running list of the sessions attended and ask your supervisor or educator to sign the list prior to submitting.

### **4. Independent Study:**

You may include reading articles and answering the test questions that appear in professional journals (i.e. CEU articles) and must provide proof of successful completion. CE hours equals the number of hours as stated in the journal.

## Certified Exposure Device Operator CONTINUING EDUCATION FOR CERTIFICATION RENEWAL

This log must be completed, signed, dated and returned. Incomplete logs will result in a delay of certification renewal. I certify the following to be true and correct:

**Name:** \_\_\_\_\_ **Cert #:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**SUPPORTING DOCUMENTATION IS REQUIRED AT THIS TIME**

### Categories of Continuing Education according to CSA Standards Certification Handbook

A	College or University Course	C	Independent Study
B	Conferences, seminars, workshops	D	Employee In-Services

### DOCUMENTATION OF CONTINUING EDUCATION REQUIREMENTS

Category of Credit (Check One): <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D Course Title/Subject Matter: _____ Location: _____ Date: _____ #Hours: _____
Category of Credit (Check One): <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D Course Title/Subject Matter: _____ Location: _____ Date: _____ #Hours: _____
Category of Credit (Check One): <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D Course Title/Subject Matter: _____ Location: _____ Date: _____ #Hours: _____
Category of Credit (Check One): <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D Course Title/Subject Matter: _____ Location: _____ Date: _____ #Hours: _____
Category of Credit (Check One): <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D Course Title/Subject Matter: _____ Location: _____ Date: _____ #Hours: _____
Category of Credit (Check One): <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D Course Title/Subject Matter: _____ Location: _____ Date: _____ #Hours: _____
Category of Credit (Check One): <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D Course Title/Subject Matter: _____ Location: _____ Date: _____ #Hours: _____
Category of Credit (Check One): <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D Course Title/Subject Matter: _____ Location: _____ Date: _____ #Hours: _____
Category of Credit (Check One): <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D Course Title/Subject Matter: _____ Location: _____ Date: _____ #Hours: _____

Supervisor / RSO Signature: _____	Total Hours: _____	Date: _____
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